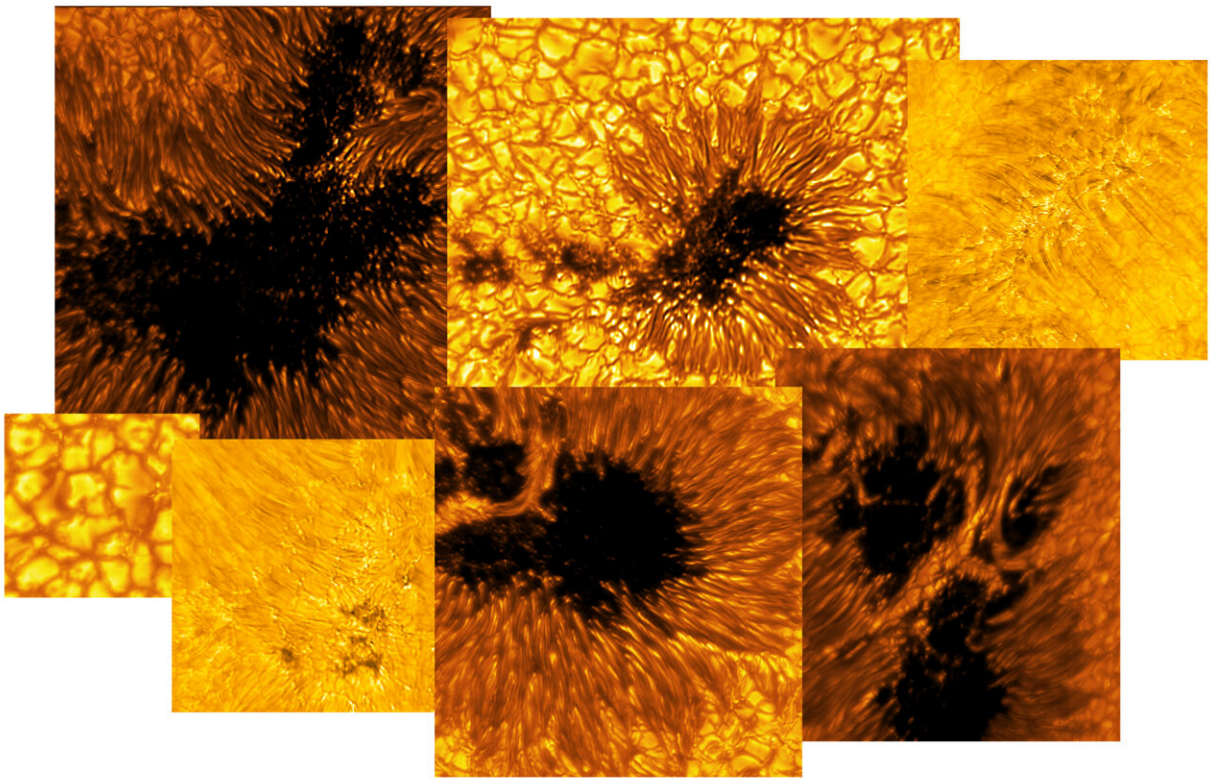
New images released by Daniel K. Inouye Solar Telescope

May 19 2023



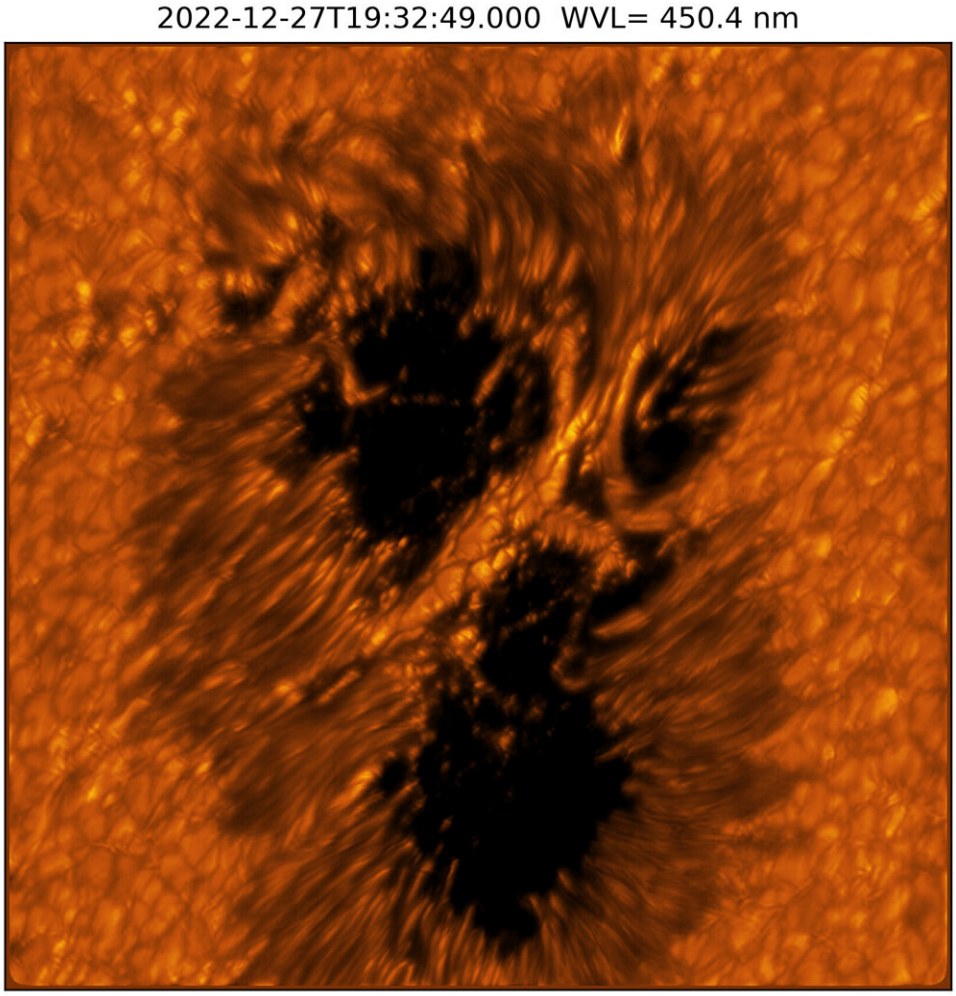
A mosaic of new solar images produced by the Inouye Solar Telescope was released today, previewing solar data taken during the telescope's first year of operations during its commissioning phase. Images include sunspots and quiet-Sun features. Credit: NSF/AURA/NSO

The National Science Foundation's (NSF) Daniel K. Inouye Solar

Telescope released eight new images of the sun, previewing the exciting science underway at the world's most powerful ground-based solar telescope. The images feature a variety of sunspots and quiet regions of the sun obtained by the Visible-Broadband Imager (VBI), one of the telescope's first-generation instruments.

The Inouye Solar Telescope's unique ability to capture data in unprecedented detail will help solar scientists better understand the sun's magnetic field and drivers behind solar storms.

The sunspots pictured are dark and cool regions on the sun's "surface", known as the photosphere, where strong magnetic fields persist. sunspots vary in size, but many are often the size of Earth, if not larger. Complex sunspots or groups of sunspots can be the source of explosive events like flares and coronal mass ejections that generate solar storms. These energetic and eruptive phenomena influence the outermost atmospheric layer of the sun, the heliosphere, with the potential to impact Earth and our critical infrastructure.



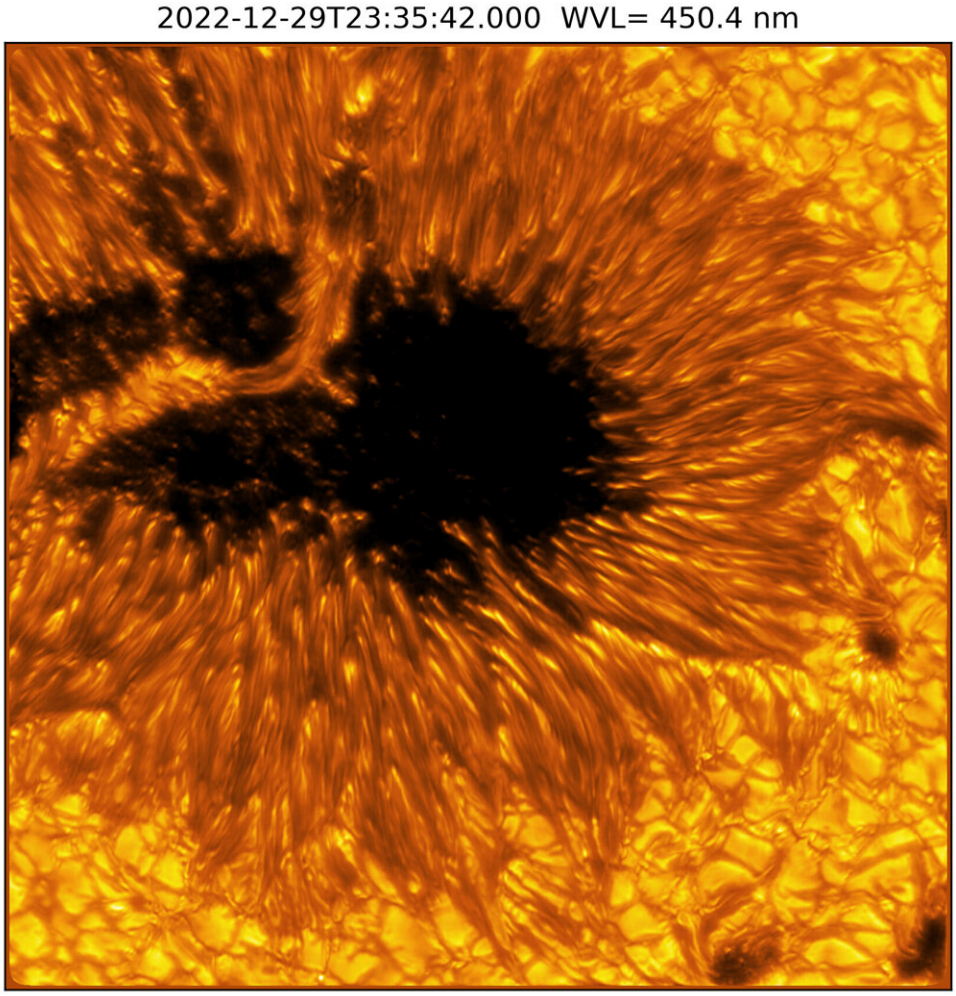
A light bridge is seen crossing a sunspot's umbra from one end of the penumbra to the other. Light bridges are believed to be the signature of the start of a decaying sunspot, which will eventually break apart. Light bridges are very complex, taking different forms and phases. It is unknown how deep these structures form. This image shows one example of a light bridge in remarkable detail.Umbra: Dark, central region of a sunspot where the magnetic field is strongest.Penumbra: The brighter, surrounding region of a sunspot's umbra characterized by bright filamentary structures. Credit: NSF/AURA/NSOImage Processing: Friedrich Wöger(NSO), Catherine Fischer (NSO), Tetsu Anan

(NSO)

In the quiet regions of the sun, the images show convection cells in the photosphere displaying a bright pattern of hot, upward-flowing plasma (granules) surrounded by darker lanes of cooler, down-flowing solar plasma. In the atmospheric layer above the photosphere, called the chromosphere, we see dark, elongated fibrils originating from locations of small-scale magnetic field accumulations.

The recently inaugurated telescope is in its Operations Commissioning Phase (OCP), a learning and transitioning period during which the observatory is slowly brought up to its full operational capabilities.

The international science community was invited to participate in this phase through an Operations Commissioning Phase Proposal Call. In response to these calls, investigators submitted science proposals requesting telescope time for a specific and detailed science goal. In order to optimize for science return, while balancing the available observing time and the technical needs in this very early operational phase, the proposals were subsequently peer-reviewed by a proposal review committee and telescope time was granted by a Telescope Allocation Committee. The selected proposals were executed in 2022 during the Cycle 1 operations window.



A detailed example of a light bridge crossing a sunspot's umbra. In this picture, the presence of convection cells surrounding the sunspot is also evident. Hot solar material (plasma) rises in the bright centers of these surrounding “cells,” cools off, and then sinks below the surface in dark lanes in a process known as convection. The detailed image shows complex light bridge and convection cell structures on the Sun's surface or photosphere.Light bridge: A bright solar feature that spans across an umbra from one penumbra to the other. It is a complex structure, taking different forms and phases, and is believed to be the signature of the start of a decaying sunspot.Umbra: Dark, central region of a

sunspot where the magnetic field is strongest. Credit: NSF/AURA/NSOImage Processing: Friedrich Wöger(NSO), Catherine Fischer (NSO), Philip Lindner at Leibniz-Institut für Sonnenphysik (KIS)

The newly released images make up a small fraction of the data obtained from the first Cycle. The Inouye Solar Telescope's Data Center continues to calibrate and deliver data to the scientists and public.

As the Inouye Solar Telescope continues to explore the sun, we expect more new and exciting results from the scientific community—including spectacular views of our solar system's most influential celestial body.

Provided by Association of Universities for Research in Astronomy

Citation: New images released by Daniel K. Inouye Solar Telescope (2023, May 19) retrieved 20 June 2024 from https://phys.org/news/2023-05-images-daniel-inouye-solar-telescope.html